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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/673,433	09/30/2003	Dengfeng Gao	ARC920030045US1	2606

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EXAMINER	
COLAN, GIOVANNA B	
ART UNIT	**PAPER NUMBER**
2162	

DATE MAILED: 03/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/673,433	GAO ET AL.	
	Examiner	Art Unit	
	Giovanna Colan	2162	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *01/30/04 01/26/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This action is issued in response to applicant filed application on 09/30/2003.

2. Claims 1 – 33 are pending.

3. The information disclosure statement (IDS) submitted on 01/30/2004 and 01/26/2004.The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claim 1 – 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. (Chu hereinafter) (Non-Patent Literature: "Least Expected Cost Query

Optimization, An exercise in Utility", ACM 1999, Philadelphia) view of Lohman et al. (Lohman hereinafter) (US Patent No. 5,301,317).

Regarding Claim 1, Chu discloses a method for estimating a query compilation time of a query optimizer comprising the steps of:

(a) receiving a query (Page 138, para. 2, lines 2 –3, Chu);

Chu further discloses join pairs for queries (Page 144, para. 86, lines 14 – 16, Chu), (c) for each join pair, identifying a set of differentiating properties and using said identified set of differentiating properties to calculate number of join plans (Page 144, para 86, lines 1 – 6, Chu[1]), and (d) estimating the compilation time from said calculated number of join plans for each type of join method (Page 140, para. 40, lines 2 – 8, Chu). However, Chu does not expressly disclose iteration. On the other hand, Lohman discloses (b) iterating through possible join pairs for said query (Fig. 8, Col. 13, lines 30 – 35, Lohman). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Lohman's teachings to Chu's system. Skilled artisan would have been motivated to do so, as suggested by Lohman (Col. 5, lines 3 – 10, Lohman), to ensure that the space of feasible plans contains efficient plans without making it too big to be generated practically, and to provide automatically adjusting the search space in response to query execution time and guaranteeing inclusion of the universal optimum. Furthermore, both of the references (Chu and Lohman) are directed

[1] Wherein the relations being joined correspond to the set of differentiating properties.

to the same field of endeavor of database management systems, such as, query optimization and compilation time estimation. This close relation between both of the references highly suggests an expectation of success.

Regarding Claim 2, the combination of Chu in view of Lohman discloses a method, wherein said join pairs are iterated by reusing existing join enumerator in said query optimizer (Col. 11, lines 36 – 43, Lohman).

Regarding Claim 3, the combination of Chu in view of Lohman discloses a method, wherein plan generation in said query optimizer is bypassed (Col. 6, lines 60 – 63, Lohman[2]).

Regarding Claim 4, the combination of Chu in view of Lohman discloses a method, wherein said set of differentiating properties comprises any of, or a combination of the following: order, data partition (Col. 7, lines 67 – 68, Lohman), pipelineability, data source, and presence of expensive predicates.

Regarding Claim 5, the combination of Chu in view of Lohman discloses a method, wherein said query is an SQL query (Col. 7, lines 4 – 5, Lohman).

[2] Wherein examiner interprets reducing the number of feasible plans as bypassing the plan generation claimed.

Regarding Claim 6, the combination of Chu in view of Lohman discloses a method, wherein said estimation of compilation time is performed via a regression model (Page 139, para.23, lines 1 – 4, Chu[3]).

Regarding Claim 7, the combination of Chu in view of Lohman discloses a method, wherein said compilation time is estimated via running regression of the following model:

$$T = T_{inst} \times \Sigma (C_t \times P_t)$$

wherein T is a machine-dependent parameter representing time per instruction (Col. 5, lines 47 – 50, plan evaluation time, Lohman), C_t is a constant representing number of instructions to generate a join plan of type t (Col. 5, lines 50 – 53, threshold, Lohman[4]), and P_t is an estimated number of join plans of type t as estimated in step (d) (Col. 5, lines 47 – 50, estimated number of plans, Lohman).

Regarding Claim 8, the combination of Chu in view of Lohman discloses a method, wherein said differentiating properties are generated in any of the following policies: a lazy policy in which said differentiating properties are generated naturally or an eager policy in which said differentiating properties are forcibly generated via an optimizer (Col. 5, lines 16 – 20, optimizer, Lohman).

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[3] Examiner interprets the bottom-up method as the regression model.
[4] Examiner interprets the threshold as a number that represents the constant number of the instructions as claimed.

Regarding Claim 9, the combination of Chu in view of Lohman discloses a method, wherein said number of join plans are calculated for any join type selected from a group consisting of: nested loops join (NLJN) (Page 145, para. 105, lines 1 – 6, Chu), sort merge join (MGJN) (Page 145, para. 107, lines 2 – 3, Chu), and hash join (HSJN).

Regarding Claim 10, the combination of Chu in view of Lohman discloses a method, wherein compilation time for multiple optimization levels are estimated in a single pass (Col. 9, lines 24 – 29, Lohman).

Regarding Claim 11, the combination of Chu in view of Lohman discloses a compilation time estimator (COTE) bypassing plan generation in a query optimizer (Col. 6, lines 60 – 63, Lohman[5]) and reusing a join enumerator to estimate compilation time of said query optimizer (Col. 11, lines 36 – 43, Lohman), said join enumerator iterating through possible join pairs for a query (Fig. 8, Col. 13, lines 30 – 35, Lohman), and, for each join pair, said COTE identifying a set of differentiating properties and using said identified set of differentiating properties to calculate number of join plans (Page 144, para. 86, lines 1 – 6, Chu[6]), and estimating compilation time from said calculated number of join plans for each type of join method (Page 140, para. 40, lines 2 – 8, Chu) via a regression model as follows,

$$T = T_{inst} \times \Sigma (C_t \times P_t)$$

[5] Wherein examiner interprets reducing the number of feasible plans as bypassing the plan generation claimed.
[6] Wherein the relations being joined correspond to the set of differentiating properties.

wherein T is a machine-dependent parameter representing time per instruction (Col. 5, lines 47 – 50, plan evaluation time, Lohman), C_t is a constant representing number of instructions to generate a join plan of type t (Col. 5, lines 50 – 53, threshold, Lohman[7]), and P_t is an estimated number of join plans of type t (Col. 5, lines 47 – 50, estimated number of plans, Lohman).

Regarding Claim 12, the combination of Chu in view of Lohman discloses a compilation time estimator (COTE), wherein said set of differentiating properties comprises any of, or a combination of the following: order, data partition (Col. 7, lines 67 – 68, Lohman), pipelineability, data source, and presence of expensive predicates.

Regarding Claim 13, the combination of Chu in view of Lohman discloses a compilation time estimator (COTE), wherein said differentiating properties are generated in any of the following policies: a lazy policy in which said differentiating properties are generated naturally or an eager policy in which said differentiating properties are forcibly generated via a optimizer (Col. 5, lines 16 – 20, optimizer, Lohman).

Regarding Claim 14, the combination of Chu in view of Lohman discloses a compilation time estimator (COTE), wherein said number of join plans are calculated for any join type selected from a group consisting of: nested loops join (NLJN) (Page 145,

[7] Examiner interprets the threshold as a number that represents the constant number of the instructions

para. 105, lines 1 – 6, Chu), sort merge join (MGJN) (Page 145, para. 107, lines 2 – 3, Chu), and hash join (HSJN).

Regarding Claim 15, the combination of Chu in view of Lohman discloses a compilation time estimator (COTE), wherein said query is an SQL query (Col. 7, lines 4 – 5, Lohman).

Regarding Claim 16, the combination of Chu in view of Lohman discloses a system for estimating query compilation time via reusing a join enumerator in a query optimizer, said system comprising:

(a) an interface to receive a query (Page 138, para. 2, lines 2 –3, Chu);

(b) a join enumerator to iterate through possible join pairs for said query, said iteration performed via reusing said join enumerator in said query optimizer (Fig. 8, Col. 11 and 13, lines 36 – 43 and 30 – 35; respectively, Lohman);

(c) a property identifier to identify, for each join pair, a set of differentiating properties and use said identified set of differentiating properties to calculate number of join plans (Page 144, para. 86, lines 1 – 6, Chu[8]); and

(d) a compilation time estimator to estimate compilation time from said calculated number of join plans for each type of join method, wherein said number of join plans are calculated for any join type selected from a group consisting of: nested loops (Page

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as claimed.

[8] Wherein the relations being joined correspond to the set of differentiating properties.

145, para. 105, lines 1 – 6, Chu), sort merge (Page 145, para. 107, lines 2 – 3, Chu), and hash.

Regarding Claim 17, the combination of Chu in view of Lohman discloses a system, wherein said set of differentiating properties comprises any of, or a combination of the following: order, data partition (Col. 7, lines 67 – 68, Lohman), pipelineability, data source, and presence of expensive predicates.

Regarding Claim 18, the combination of Chu in view of Lohman discloses a system, wherein said compilation time estimator uses a regression model to estimate said compilation time (Page 139, para.23, lines 1 – 4, Chu[9]).

Regarding Claim 19, the combination of Chu in view of Lohman discloses a system, wherein said compilation time is estimated via running regression of the following model:

$$T = T_{inst} \times \Sigma (C_t \times P_t)$$

wherein T is a machine-dependent parameter representing time per instruction (Col. 5, lines 47 – 50, plan evaluation time, Lohman), C_t is a constant representing number of instructions to generate a join plan of type (Col. 5, lines 50 – 53, threshold,

[9] Examiner interprets the bottom-up method as the regression model.

Lohman[10]), and P_t is an estimated number of join plans of type t as estimated in step (d) (Col. 5, lines 47 – 50, estimated number of plans, Lohman).

Regarding Claim 20, the combination of Chu in view of Lohman discloses a system, wherein said differentiating properties are generated in any of the following policies: a lazy policy in which said differentiating properties are generated naturally or an eager policy in which said differentiating properties are forcibly generated via a optimizer (Col. 5, lines 16 – 20, optimizer, Lohman).

Regarding Claim 21, the combination of Chu in view of Lohman discloses a system, wherein said query is an SQL query (Col. 7, lines 4 – 5, Lohman).

Regarding Claim 22, the combination of Chu in view of Lohman discloses a article of manufacture comprising computer usable medium having computer readable program code embodied therein estimating a query compilation time of a query optimizer via reusing an existing join enumerator in said query optimizer, said medium comprising:

(a) computer readable program code aiding in receiving a query (Page 138, para. 2, lines 2 –3, Chu);

(b) computer readable program code iterating through possible join pairs for said query (Fig. 8, Col. 13, lines 30 – 35, Lohman);

[10] Examiner interprets the threshold as a number that represents the constant number of the instructions

(c) for each join sequence, computer readable program code identifying a set of differentiating properties and using said identified set of differentiating properties to calculate number of join plans (Page 144, para 86, lines 1 – 6, Chu[11]); and

(d) computer readable program code estimating compilation time from said calculated number of join plans for each type of join method (Page 140, para. 40, lines 2 – 8, Chu).

Regarding Claim 23, the combination of Chu in view of Lohman discloses a article of manufacture, wherein said estimation of compilation time is performed via a regression model (Page 139, para.23, lines 1 – 4, Chu[12]).

Regarding Claim 24, the combination of Chu in view of Lohman discloses a article of manufacture, wherein said set of differentiating properties comprises any of, or a combination of the following: order, data partition (Col. 7, lines 67 – 68, Lohman), pipelineability, data source, and presence of expensive predicates.

Regarding Claim 25, the combination of Chu in view of Lohman discloses a article of manufacture, wherein said compilation time is estimated via running regression of the following model:

$$T = T_{inst} \times \Sigma (C_t \times P_t)$$

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as claimed.
[11] Wherein the relations being joined correspond to the set of differentiating properties.
[12] Examiner interprets the bottom-up method as the regression model.

wherein T is a machine-dependent parameter representing time per instruction (Col. 5, lines 47 – 50, plan evaluation time, Lohman), C_t is a constant representing number of instructions to generate a join plan of type t (Col. 5, lines 50 – 53, threshold, Lohman[13]), and P_t is an estimated number of join plans of type t as estimated in step (d) (Col. 5, lines 47 – 50, estimated number of plans, Lohman).

Regarding Claim 26, the combination of Chu in view of Lohman discloses a article of manufacture, wherein said differentiating properties are generated in any of the following policies: a lazy policy in which said differentiating properties are generated naturally or a eager policy in which said differentiating properties are forcibly generated via a optimizer (Col. 5, lines 16 – 20, optimizer, Lohman).

Regarding Claim 27, the combination of Chu in view of Lohman discloses a article of manufacture, wherein said number of join plans are calculated for any join type selected from a group consisting of: nested loops join (NLJN) (Page 145, para. 105, lines 1 – 6, Chu), sort merge join (MGJN) (Page 145, para. 107, lines 2 – 3, Chu), and hash join (HSJN).

Regarding Claim 28, the combination of Chu in view of Lohman discloses a method for estimating query compilation time in a query optimizer, said method comprising the steps of:

[13] Examiner interprets the threshold as a number that represents the constant number of the instructions

bypassing plan generation and reusing a join enumerator of said query optimizer to identify number of joins (Col. 6, lines 60 – 63, Lohman[14]);

iterating through possible pairs for a query (Fig. 8, Col. 13, lines 30 – 35, Lohman);

for each join, accumulating a set of differentiating properties during enumeration and using said identified set of differentiating properties to calculate number of join plans (Page 144, para 86, lines 1 – 6, Chu[15]); and

estimating compilation time from said calculated number of join plans for each type of join method via a regression model (Page 140, para. 40, lines 2 – 8, Chu).

Regarding Claim 29, the combination of Chu in view of Lohman discloses a method, wherein said set of differentiating properties comprises any of, or a combination of the following: order, data partition (Col. 7, lines 67 – 68, Lohman), pipelineability, data source, and presence of expensive predicates.

Regarding Claim 30, the combination of Chu in view of Lohman discloses a method, wherein said query is an SQL query (Col. 7, lines 4 – 5, Lohman).

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as claimed.

[14] Wherein examiner interprets reducing the number of feasible plans as bypassing the plan generation claimed.

[15] Wherein the relations being joined correspond to the set of differentiating properties.

Regarding Claim 31, the combination of Chu in view of Lohman discloses method, wherein said compilation time is estimated via running regression of the following model:

$$T = T_{inst} \times \Sigma (C_t \times P_t)$$

wherein T is a machine-dependent parameter representing time per instruction (Col. 5, lines 47 – 50, plan evaluation time, Lohman), C_t is a constant representing number of instructions to generate a join plan of type t(Col. 5, lines 50 – 53, threshold, Lohman[16]), and P_t is an estimated number of join plans of type t as estimated in step (d) (Col. 5, lines 47 – 50, estimated number of plans, Lohman).

Regarding Claim 32, the combination of Chu in view of Lohman discloses a method, wherein said differentiating properties are generated in any of the following policies: a lazy policy in which said differentiating properties are generated naturally or an eager policy in which said differentiating properties are forcibly generated via a optimizer (Col. 5, lines 16 – 20, optimizer, Lohman).

Regarding Claim 33, the combination of Chu in view of Lohman discloses a method, wherein said number of join plans are calculated for any join type selected from a group consisting of: nested loops join (NLJN) (Page 145, para. 105, lines 1 – 6, Chu), sort merge join (MGJN) (Page 145, para. 107, lines 2 – 3, Chu), and hash join (HSJN).

Prior Art Made Of Record

1. Chu et al. (Non-Patent Literature: "Least Expected Cost Query Optimization, An exercesie in Utility", ACM 1999, Philadelphia)

2. Lohman et al. (US Patent No. 5,301,317, issued: April 5, 1994) discloses a system for adapating query optimization effort to expected execution time.

3. Lohman et al. (US Patent No. 6,092,062) discloses a relational database query optimization to perform query evaluation plan, pruning based on the partition properties.

4. Hoang (US Patent No. 5,761,657) discloses a global optimization of correlated subqueries and exists predicates.

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[16] Examiner interprets the threshold as a number that represents the constant number of the instructions as claimed.

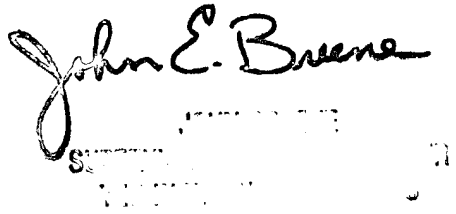
Points Of Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Giovanna Colan whose telephone number is (571) 272-2752. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Breene can be reached on (571) 272-4107. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Giovanna Colan
Examiner
Art Unit 2162
March 17, 2006



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